AMENDED CLAIMS (ART 19 PCT)

1. A method for producing a heat exchange element having great efficiency, limited bulk, small weight, low production cost and, generally, intrinsic stability, characterized in that it comprises the following steps:

- producing in a mold (50), by thermo-blow moulding or hydroforming, a preform (32) made of a suitable material, constituted by a stack of globally biconvex bellows (34), relatively deep relative to the transverse dimension of the preform and comparable to those of an accordion, said bellows comprising elongated central parts, equipped with end connectors (40-42), flanks (33-35), tips (36) and bottoms (38) having respectively appropriate shapes so that these flanks (33-35) have a much greater rigidity than those of the bottoms (38) and the tips (36), said stack itself being equipped with two transverse connections (28-30), centred on the stacking axes (25-27) of said end connectors (40-42);
- the elements constituting this preform (32) having suitable temperatures, flexibilities and elasticities, applying an internal depression and/or external compression forces to them, parallel to the stacking axis of the bellows, up to the point where the thus-produced compressed part (10) becomes a stack of pairs of hollow plates (12-22), communicating (16) and globally symmetrical, with substantially constant small internal thickness (14) and spacing (18)
- allowing the single-piece part (10) so manufactured to cool, while keeping it compressed;
- if necessary, after cooling the thus-produced part (10), surrounding it with a member (81) ensuring its clamping, in order to maintain at their initial values the spaces between the walls of the pairs of plates (22).

2. The method for producing an elementary heat exchanger according to claim 1, characterized in that the mold (50) to be used for its implementation comprises flared grooves (62) with rectilinear, narrow and parallel tips (70) and bottoms (66), the flanks (68 a-b) of these grooves (62) are embossed, the humps of one flank facing the hollows of the other.

3. The method for the production of an elementary heat exchanger according to claim 2, characterized in that the median longitudinal planes of the embossed flanks (68 a-b) of the mold (50) form angles of 20 to 30° with their plane of

symmetry and their end connectors (67 a-b and 69 a-b) have profiles with invertible surfaces.

4. Heat exchange element (20) formed by a stack of hollow plates (14) equipped with two transverse feed manifolds connected to two connecting pipes (24-26), characterized in that:

- this element (20) is a single active part [(10)] without assembly or welding ;
- the internal faces of the walls (12a-b or 150a-b / 152a-b / 154a-b) of all the hollow plates (22 or 140-142) are without contact with each other, and the same applies to the external faces of the walls of two contiguous hollow plates (140-142) ;
- the internal and external faces of the walls of all the hollow plates are at all points separated respectively from one another by narrow, substantially constant, spaces (14 or 144);
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- each hollow plate (22) is symmetrical with another hollow plate and both communicate through a side of channel (16) common to all the plates, in order to form a pair of hollow plates constituting an elementary conduit of said active part (10);
- each elementary conduit [of the active part (10) has two elongate hollow central portions (23), the ends of which are connected by two hollow connectors (24-26), through which the two feeding collectors (44-46) of the heat exchanger pass.

5. Elementary heat exchanger (20) according to claim 4, characterized in that the walls (150a-b / 152a-b / 154a-b) of the pairs of hollow plates (140-142) are embossed and globally symmetrical, but their median longitudinal planes are perpendicular to their plane of symmetry.

6. Elementary heat exchanger (20) according to claim 4, characterized in that the walls (150a-b / 152a-b / 154a-b) of the of the pairs of hollow plates (140-142) are embossed and globally symmetrical, but their median longitudinal planes together form dihedrals of 120 to 160° and their end connectors (24-26) have been made from invertible surfaces.

ART 19 AMDT

7. A preform (32), realized by implementing the first step of the method according to claim 1 for producing a single-piece elementary heat exchanger, characterized in that:

- it comprises a stack without welding of globally biconvex bellows (33, 35, 37, 39) comparable to those of an accordion;
- the ends of the central parts of these bellows are provided with symmetrical connectors which are, if appropriate, invertible (40-42);
- the bellows of this stack have shaved tips (36a-b) and narrow bottoms (38a-b), the rigidities of these bottoms and tips are very small relative to that of their flanks (33a-b / 35a-b / 37a-b / 39a-b);
- the flanks of the bellows and those of the end connectors (40-42) have substantial depths, relative to the transverse dimension of the preform (32).

8. The preform (32) according to claim 7, characterized in that, in order to ensure a suitable rigidity of the flanks (33a-b / 35a-b / 37a-b / 39a-b) of the bellows, each flank presents an alternating succession of hollows (120) and humps (122), in particular in the form of roofs with four pitches, the hollows of one flank corresponding to the humps of the other.

9. Heat exchanger for confined fluids, comprising at least one active heat exchange element (20) according to claim 4, installed in a casing (81), which completely surrounds said element (20), closely matching its overall outer shape, while still preserving narrow gaps with respect thereto and allowing the passage of the two connection pipes of the active element (20), characterized in that:

- the casing (81) is formed by two half-shells (80-82) ; - each half-shell (80-82) encases a longitudinal half of the active heat exchange element (20) and comprises, at each of its ends, a connection half-branch (94-110), and in its bottom, an opening ;
- the edges (98a-b and 114a-b) of these half-shells and of these half-branches are fixed to each other in a tight manner, and the edge or edges (92) of these openings (90), also fixed to one of the two connection branches (28-30) of this active heat exchange element (20).

ART 19 AMDT

10. A mold (50) for the production of a preform (32) of the active part (20) of an elementary heat exchanger, realized according to the method of claim 1, characterized in that:

- it comprises two metal jaws (52), in the form of parallelepipedic blocks, symmetrical relative to their parting line (56);
- in each of these blocks (54), are hollowed-out elongated flared grooves (62), with rectilinear, narrow and parallel tips (70) and bottoms (66), the flanks (68a-b) of which are embossed, the hollows and humps of one facing the humps and hollows of the other,
- the tips (70) of the projections separating the grooves (62) are parallel to the parting line (56) and they present, relative to this plane, a gap greater than their own width;
- the angles formed with their plane of symmetry by the median longitudinal planes of the flanks (68a-b) of each of the grooves (62) of the mold are greater than a minimum angle dictated by the correct-molding conditions of the tips of the preform and, preferably, less than a maximum angle of inversion dictated by the breaking point of the material used;
- the ends of the flanks (68a-b) and of the bottoms (66) of the grooves (62) join to form symmetrical surfaces, if appropriate, with an invertible profile (67a-b and 69a-b), which end at the parting line (56) of the mold, the two stacking axes (25-27) of these faces being situated in this parting line;
- these two stacking axes (25-27) being those of the two future main feed lines (44-46) of the elementary conduits of the active part, cylinder portions (72-74) are cut in each of the projections separating two contiguous grooves, in order to delimit these main lines;
- one of the two ends of each of these axes (25-27) comprises a semicylindrical cavity (76-78), provided for molding half of one of the two connection branches (28-30) of the active part (20);
- one of these semicylindrical cavities (76) opens to the outside.

ART 19 AMDT